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(71) Applicant(s)
I-Data International A/S
(Incorporated in Denmark)
Vadstrupvej 35-43, Bagsvaerd, DK-2880, Denmark

(72) Inventor(s)
Claes Christian Hougaard
Rune Windfield Bundesen
Theis Olsen
Trygve Thor Nordly

(74) Agent and/or Address for Service
Eric Potter Clarkson
Park View House, 58 The Ropewalk, NOTTINGHAM,
NG1 5DD, United Kingdom

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(54) Abstract Title
Ensuring secure transfer of a document from a client of a network to a printer

(57) A system ensures secure transfer of a document from a client of a network to a printer. A printing control system, which ensures users of a network secure access to a print job designated to any users of the network, comprises a client station (102') designating a print job to any of the users, a job database (110) receiving a spooled document from the client station (102'), a printer communication unit receiving user identifying data, a server (136) enabling the users access to the network and validating the users on the basis of the user identifying data against user information stored in a user table (114), a printer (116) receiving the spooled document from the job database (110), receiving a print request from the users and communicating the print request to the server, and additionally a print engine (142) compiling the spooled document to be communicated to the printer (116).

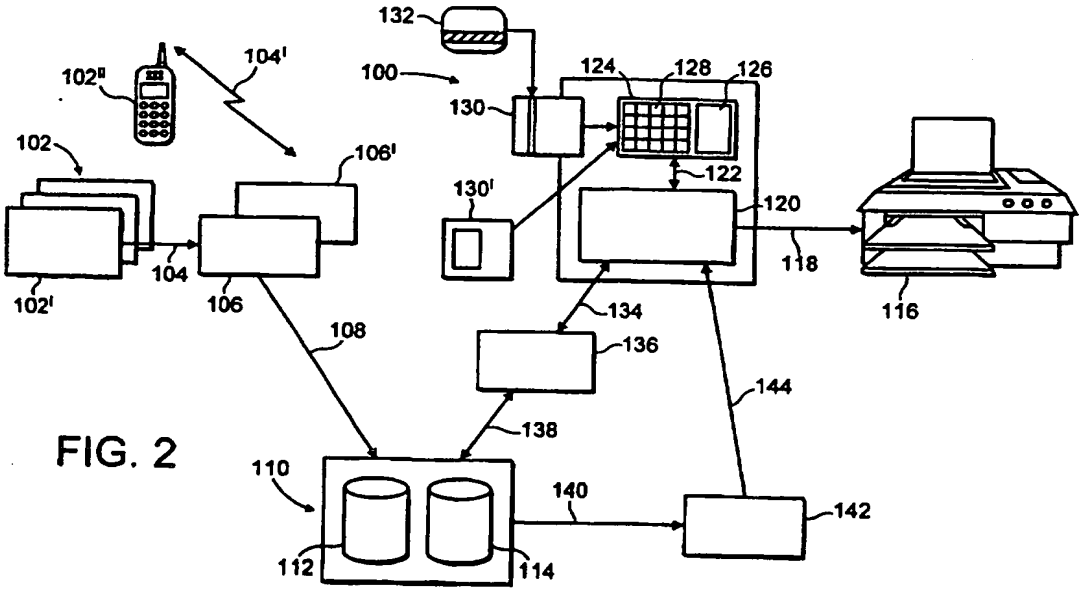


FIG. 2

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

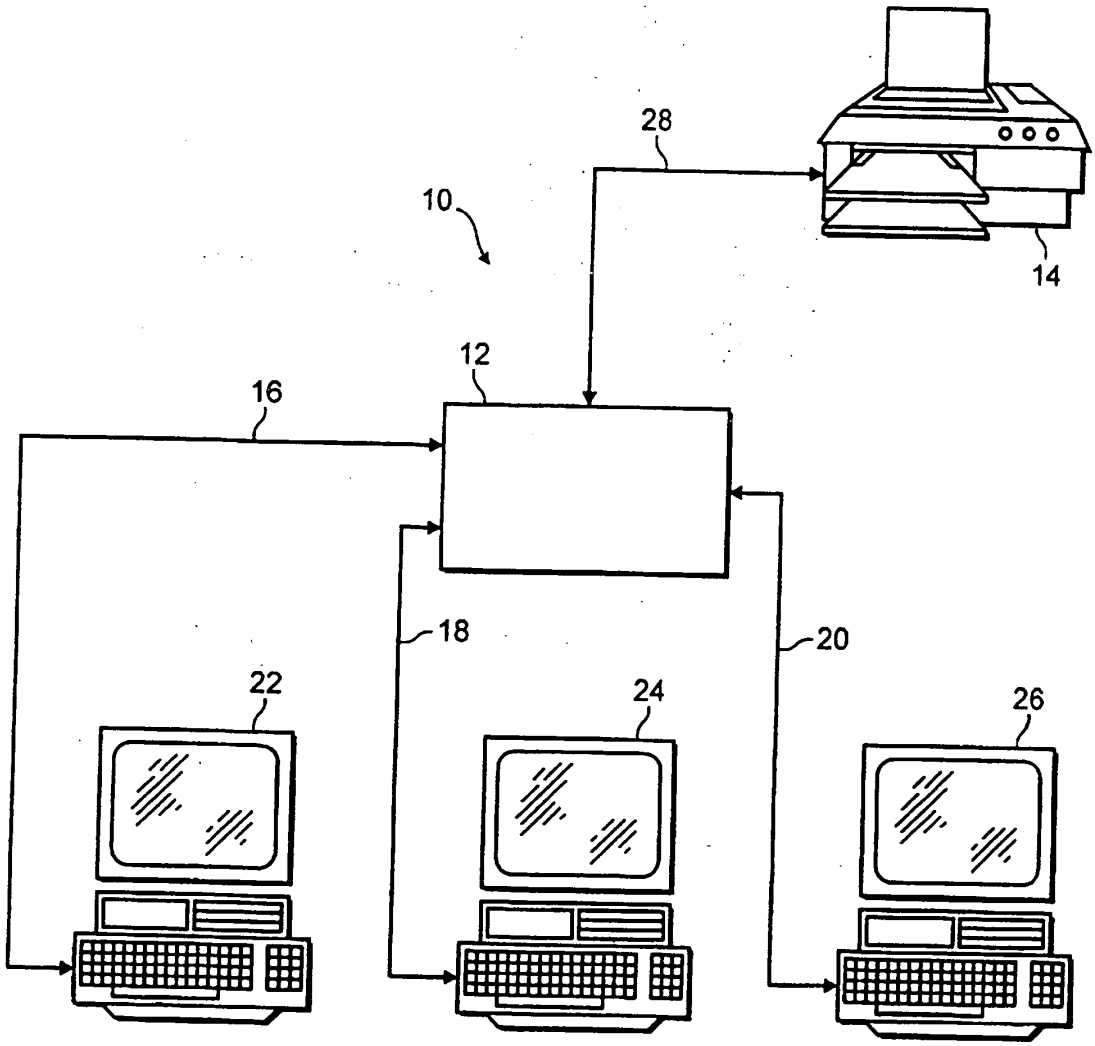


FIG. 1

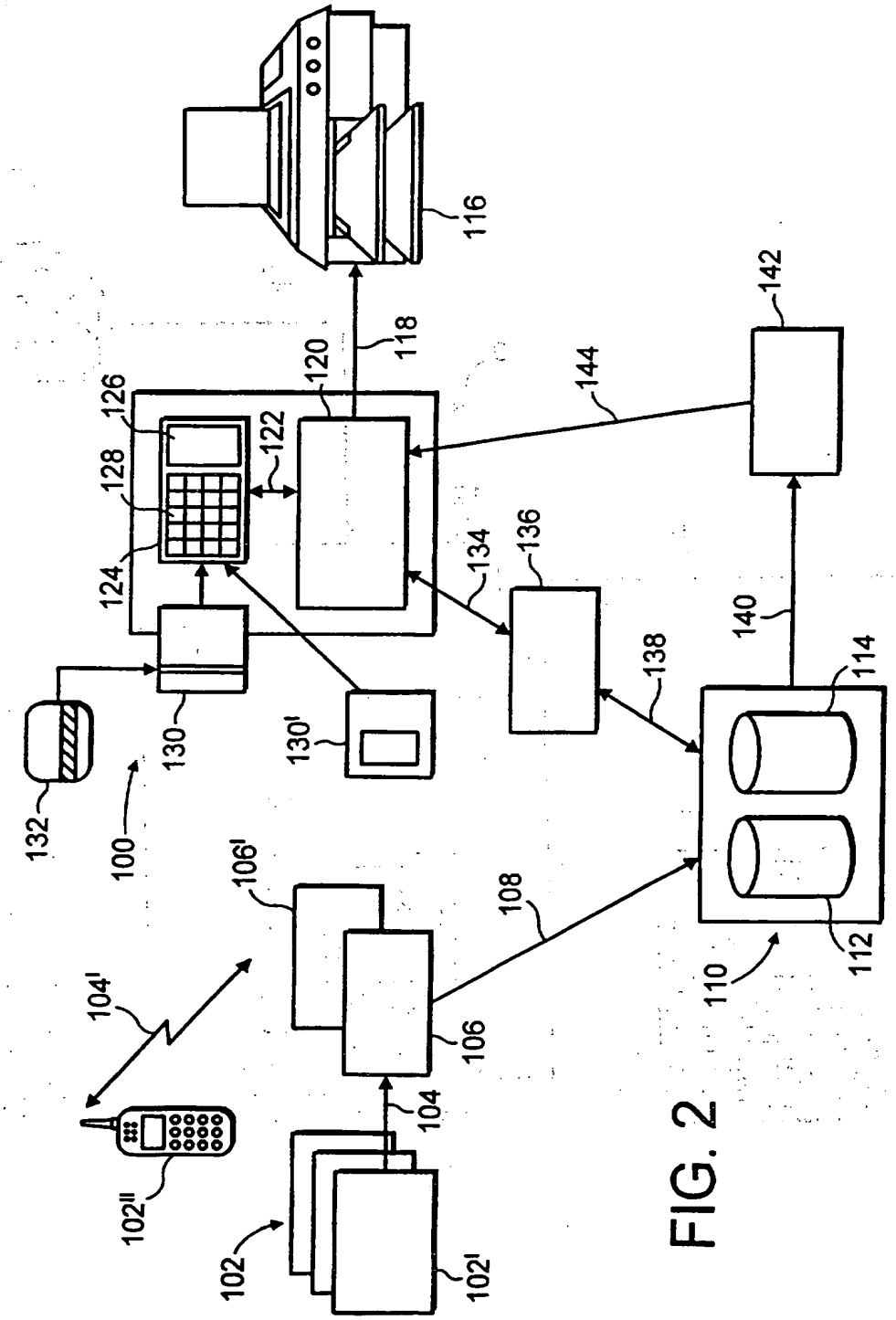

116
118
120
126
128
124
122
144
142
136
134
140
138
114
130
130'
132
100
106'
108
104'
106
104
110
112
102''
102
102'

FIG. 2

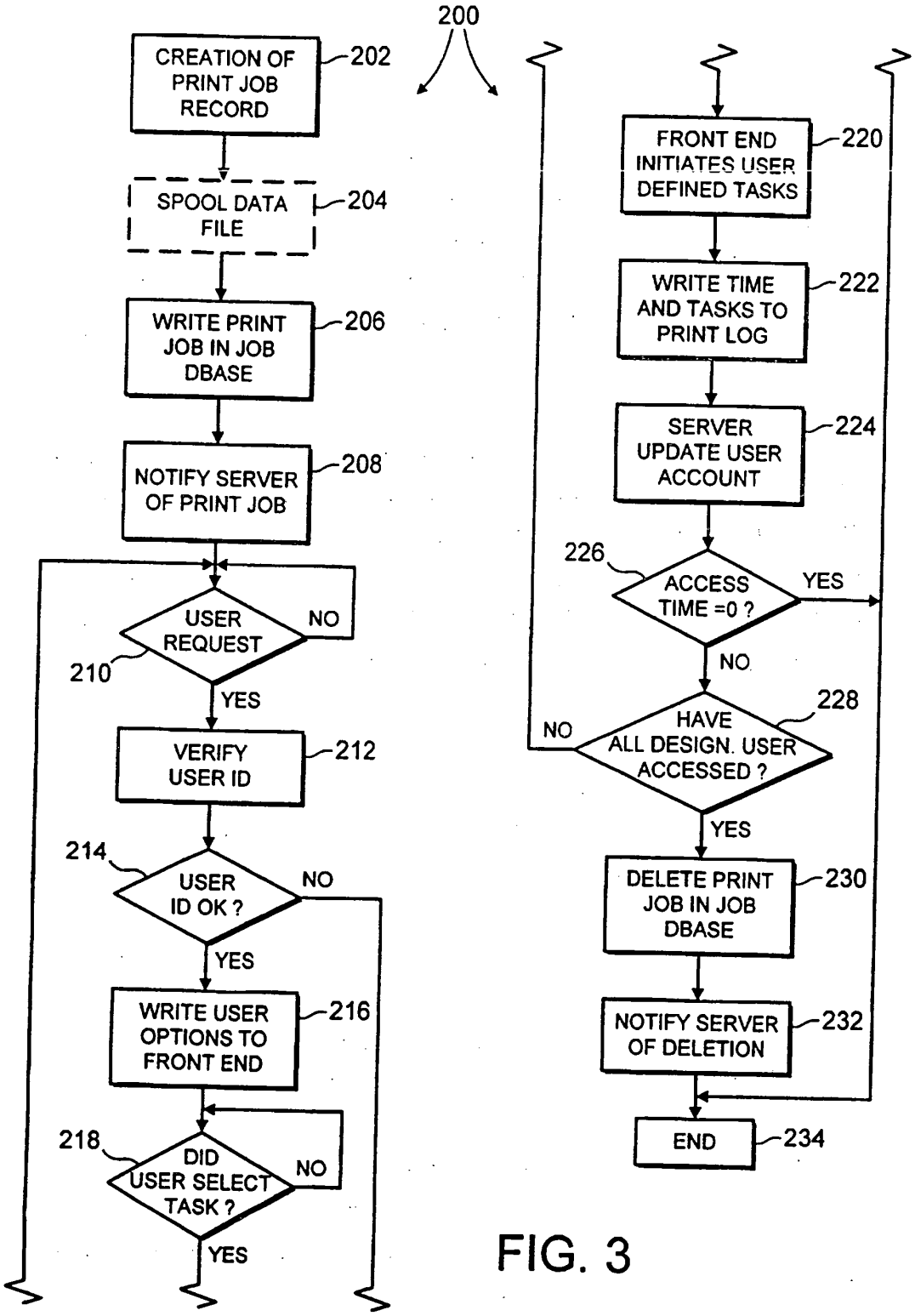

200
CREATION OF PRINT JOB RECORD
202
SPOOL DATA FILE
204
WRITE PRINT JOB IN JOB DBASE
206
NOTIFY SERVER OF PRINT JOB
208
USER REQUEST
NO
210
YES
VERIFY USER ID
212
214
USER ID OK ?
NO
YES
WRITE USER OPTIONS TO FRONT END
216
218
DID USER SELECT TASK ?
NO
YES
FRONT END INITIATES USER DEFINED TASKS
220
WRITE TIME AND TASKS TO PRINT LOG
222
SERVER UPDATE USER ACCOUNT
224
226
ACCESS TIME =0 ?
YES
NO
228
HAVE ALL DESIGN. USER ACCESSED ?
NO
YES
DELETE PRINT JOB IN JOB DBASE
230
NOTIFY SERVER OF DELETION
232
END
234

FIG. 3

System and method for ensuring secure transfer of a document from a client of a network to a printer.

The invention relates to a printing control system and a printing control method for ensuring secure transfer of documents from a client connected to a network such as a local area network (LAN) or a wide area network (WAN) to a user who is allowed access to the documents from a printing communication unit connected to a printer. The printing control system and printing control method provides means for a client station to designate a document to a single user or a group of users and provides the possibility for the single user or the group of users to access the document at a plurality of printer communication units.

The state of the art provides several techniques for enabling a client the opportunity to share documents and directories with other clients connected to a network. Thus the state of the art provides other clients connected to a network to access a document and perform printing of the document either locally or at any printer accessible through the network. However, the state of the art fails to perform a secure transfer of the documents provided by the sharing client since the documents may be printed at any printer connected to the network and at any time according to the selected printer's job queue. Hence the user of the network may transmit a shared document as a print job to the printer's job queue without knowing when the printer actually prints the shared document and consequently the shared document may lay open to inspection by anybody at the printer.

In sharing a document or directory in the state of the art network system, the client sharing a document or directory may determine which clients of the network are allowed access to the shared document or shared directory. The state of the art network system, however, does not inform the sharing client which client or clients in the network have actually accessed the shared document or directory. Neither does the state of the art network system provide billing of the accessing clients when the shared document is opened or printed. Generally the state of the art network system provides the opportunity to share documents with designated users or clients of the network system without providing client's access times, clients accessing the shared document and accounting information to the sharing client.

A method and apparatus for managing remotely located document producing machines by using cellular radios is described in US patent no. US 5,787,149 hereby incorporated by reference in the patent specification. The US patent discloses an apparatus for managing a series of document producing machines such as printers, copiers or faxing machines by recording and transmitting use of the machines to a managing unit so as to provide a vendor leasing the machines to lessees with a picture of how much the machines are used. The vendor may then utilise the information transmitted from the machines to bill the lessees according to the lessees' use. The apparatus described in US 5,787,149 provides billing of a lessee in accordance with use of a leased document producing machine, however, the apparatus does not provide means for billing separate users having access to the leased document producing machine for producing prints of documents on the leased document producing machine.

An object of the present invention is to provide a system and method enabling safe printing of a print job by securing a transmission of the print job through a network to a printer and only releasing the print job to a user designated by a client of the system and method to access the print job.

A further object of the invention is to provide a system and method for distributing a document to a plurality of users while maintaining a secure transfer of information from the transmitting client to the plurality of users.

A particular advantage of the present invention is the provision in the system and the method of controlled discriminatory user access to a printer connected in a network by identifying users at the printer.

A particular feature of the present invention is the provision in the system and the method of an account or credit for each user so that the each user is allowed printing operations at the printing in accordance with user credit.

The above object, advantage and feature together with numerous other objects, advantages and features which will become evident from the below detailed description of a preferred embodiment of the present invention is according to a first aspect of the

present invention obtained by printing control system for ensuring one or more users of a network (such as a LAN: local area network, or a WAN: wide area network) secure access to a print job designated to said one or more users of said network, and said printing control system comprising:

(a) a client station of a first plurality of client stations for designating said print job to said one or more users, said print job defining a document containing user readable information and defining a header containing document access information,

(b) a spool connected to said client station for spooling of said document and substituting said document in said print job with a spooled document,

(c) a job database connected to said spool for receiving said spooled document and said header from said client station, said job database defining a document table and a user table and storing said spooled document in said document table and storing said header in said user table,

(d) a printer communication unit of a second plurality of printer communication units for receiving user identifying data input by said one or more users to said printer communication unit,

(e) a server managed by a network administrator and interconnecting said printer communication unit to said job database for establishing said one or more users in said user table enabling said one or more users access to said network, for validating said one or more users on the basis of said user identifying data input to said printer communication unit against user information stored in said user table, and for ensuring said user identifying data and said user information provide said one or more users access to said spooled document,

(f) a printer connected to said printer communication unit for receiving said spooled document from said job database and having a request input for receiving a print request from said one or more users and communicating said print request to said server, and

(g) a print engine interconnecting said job database and said printer communication unit for compiling of said spooled document to be communicated to said printer through said printer communication unit, said print engine receiving said spooled document from said document table in said job database.

According to the basic realisation of the first aspect of the present invention the printing

control system enables a plurality of client stations to designate a data file or document to a plurality of users accessing the printing control system by identifying themselves at any printer connected to the network. Thus providing a secure transfer of the data file or document designated to one user or a plurality of users from any of the client stations connected to the network by determining the identity of each user requesting a print of the data file or document. The transfer is further secured by encrypting the document before transferring the document through the network by utilising either a public encryption key or private encryption key.

The term one or more users as applied in this context should be construed as an individual user, a population of users, a plurality of users, a multiplicity of users or group of users, or an individual user in the said population of users.

The one or more users of the printing control system do not necessarily have to be provided with or have access to an individual client station, since the one or more users may simply have access to the print jobs display at the printer communication unit but access to designate print jobs. The printing control system may therefor ideally be utilised for distributing information such as working schedules, tasks or any other type of information to employees having no access to an individual client station in the network but entirely access to the printer communication unit. This may be employees such as machining tool operators, medical personal, sales assistance or chauffeurs not needing a personal computer or the like for performing their daily work. These employees may collect their daily tasks from a printer communication unit positioned at any location accessible to the employees.

The secure transfer of the document and further communication between elements of the printing control system is provided on the network is established by bus connections, by cable connections such as current carrying cables and/or optical cables, by wireless links such as mobile radio transmission links, infra-red transmission links or ultra-sonic transmission links, or by any combination thereof. By utilising bus connections between some or all elements of the printing control system a particular fast communication is achieved. However, generally communication between elements of the printing control system is performed on a wide variety of connections thus providing a very dynamic communication system.

Utilising mobile radio transmission links as for providing at least part of the network communication ensures a printing control system of great versatility, since the printing control system as such become mobile and client station may access the network from any position within range of a mobile radio transmitter station.

The communications between elements of the first aspect of the present invention comprises control signalling and document transfer. The document is constituted by a file configured in any binary format such as text format, comma or space separated variable format, or any user or software-defined format. By employing a printing control system accepting any binary file format provides a great advantage since it enables communication between two otherwise non-compatible systems is achieved. The header contains information such as information regarding data stream format such as PostScript, PDF, IPDS, PCL, PCLXL or AFP format, print formats such as simplex, duplex, colour, page size, page rotation, tray, stapling, number of pages of the spooled document, access for said one or more users to said spooled document, a digital client signature, duration in which the one or more users are allowed access to the spooled document, and number of pages defined by the spooled document or any combination thereof. The header ensures that the user table is updated with relevant information regarding which users are allowed access to the spooled document.

Further in accordance with the first aspect of the present invention each of the first plurality of client stations comprise a local memory, a display, a keyboard and preferably a local central processing unit such as constituted by personal computers, computer workstations and/or such as constituted by mobile communication clients like mobile phones or mobile communicators or any combinations thereof. Generally the first aspect of the present invention may be established incorporating a wide variety of client station types thus ensuring communication and transfer between various client types.

The spool provided for in the first aspect of the present invention performs spooling of the document according to a data stream format such as to PostScript, PDF, IPDS, PCL, PCLXL or AFP format. The printing control system allows for any data stream format to be utilised, hence ensuring further that generally a wide variety of printer types may be connected to the printing control system.

The printing control system establishes a secure network by utilising secure networking procedures providing symmetrical and/or asymmetrical encryption in accordance with public and/or private encryption keys. The encryption provided by the spool enhances security of the transmission between client stations connected in the network.

Additionally, the spool incorporates a port monitor for parsing the spooled document in order to determine data stream format such as PostScript, PDF, IPDS, PCL, PCLXL or AFP format, and further to determine print formats such as simplex, duplex, colour, page size, page rotation, tray, stapling, and number of pages the spooled document will constitute during printing of said spooled document. The page count is utilised for determining the price for performing a print of the spooled document at any printer connected to the network.

Further, in accordance with the first aspect of the present invention the job database is established on a memory storage unit accessible by the server such as magnetic storable hard disk, magnetic storable tape and/or magneto-optic storage disks on the server having the user table and the document table allocated in storage spaces on the memory storage unit. Further, the user table allocates a record space in the memory storage unit for the header, and the document table allocates a storage space in the memory storage unit for the spooled document. Alternatively, the user table allocates a record space in the memory storage unit for the header, and the document table allocates a storage space in the memory storage unit for a pointer to the spooled document on the local memory of the client station or in the document table. It is further possible to implement the server incorporating the spool, the job database and the print engine in a server memory. Thus providing a system which may utilised a bus hence significantly increasing processing and transmission times between elements of the present invention.

Any of alternative the above mentioned types of storage media may serve as a memory storage unit, hence the first aspect of the present invention ensures compatibility between new and older communication systems and additionally, provides a choice of storage media in accordance with the necessary capacity of the printing control system.

The printer communication unit according to the first aspect of the present invention comprises a front-end module for identifying the one or more users of the network and a control unit for providing an interface for the print engine and the server to the printer. In order to accomplish communication between the user and the printer communication unit the front-end module comprises a display for showing the user accessible print jobs and operations menus, and comprises a keypad for providing an interface between the user and the front-end.

The display according to the first aspect of the present invention utilises cathode-ray tube screen techniques or the display utilises liquid crystal display techniques. Either type of display provide high resolution clear visual graphic interfaces for the user. The keypad is constituted by a general personal computer keyboard, a numerical keypad or a functional keypad or constituted by a touch sensitive film mounted on the display so as to allow the user to perform user operations by pressing the touch sensitive film in accordance with information showed on the display. Utilising a touch screen further enhances the graphics interface between the user and the printer communication unit.

The front-end module according to the first aspect of the present invention comprises a iris scanner, a fingerprint reader for identifying the one or more users at the front-end module and/or preferably a card reader for reading card information from a card such as a credit card, a library card, a health insurance card, a driving licence card, a passport card, a membership card, a company identity card or an institutional identity card. The card information includes information such as card user name, card user ID, card user credit, card user's access rights, card user's server address, card user identifying number, card issuing date, card identity number, digital signature of one or more of said client station of said first plurality of client stations or any combination thereof. The card reader receives card information from the card and communicates the card information to the server. The front-end module requests a first user pin code.

Further, in accordance with the first aspect of the present invention the card utilises electronic storage techniques, electro-magnetic storage techniques, magnetic storage techniques, magneto-optic storage techniques, optic storage techniques or any combinations thereof for storing of the card information.

The user identifying data includes the card information and the first user pin code and the user information stored in the user table includes system user name, system user ID, system user credit, system user's access rights, system user's server address, system user identifying number, system user PUK code (personal user key), system user initiation date or any combination thereof, and a second user pin code. The control unit transmits upon receipt of the first pin code the user identifying data to the server for verification. This transmission is accomplished by the control unit communicating with the front-end module and the printer through a parallel connection, a serial connection, a local area network (LAN) connection, a wireless connection such as a mobile radio transmission connection, an infra-red transmission connection or an ultra-sonic transmission connection, or any combination thereof.

The user identifying data includes the card information and a first user pin code and the user information stored in the user table includes system user name, system user ID, system user credit, system user's access rights, system user's server address, system user identifying number, system user PUK code, system user initiation date or any combination thereof, and a second user pin code. The server establishes and validates the one or more users by identifying the user information in the user table on the basis of the user identifying data and by matching the first pin code with the second pin code. Alternatively, during first use of the card by matching the system user PUK code with an entered user PUK code and the server locating in the document table all print jobs designated for the one or more users and communicating titles of all print jobs designated for the one or more users to said front-end display enabling the one or more users to select a print job or a multiplicity of print jobs.

Hence the server performs the verification of user identifying data by comparing the first pin code transmitted from the control unit with the second pin code attached to the user information stored in said user table. Furthermore, the server locates in the user table all print jobs designated for the user and communicates titles of all print jobs designated for the user to the front-end display enabling the user to select a print job. When the server has verified the user then the user may select any of the listed available print jobs and perform various operations on the available print jobs.

As the server receives a print job selection from the one or more users at the front-end

module and the server provides the one or more users access to the spooled document in the document table in the job database upon validation of the user identifying data.

Subsequently the server provides an opportunity for the one or more users to delete the spooled document from the one or more users' print job list, determine desired number of copies required of the spooled document, retain printing of the spooled document in a draft version for a first price, view the spooled document on the display for a second price, print the spooled document on the printer for a third price and terminate further operations on the front-end module. The price of these optional operations allowed the user at the printer communication unit might be determined in accordance with various criteria. For example the price for printing of the spooled document may be different for each user depending on number of copies taken of the spooled document or depending on who the author of the particular spooled document is. Further the price might be based on the relative to for example artists royalty fees such as for example Koda-Gramex fees.

The server deducts the credit of the one or more users of a first amount equal to the first price if the one or more users prints a draft version of the spooled document, a second amount equal to the second price if the one or more users views the spooled document and a third amount equal to the third price if the one or more users prints the spooled document or the server establishes a client credit record for each of the client stations designating the one or more users and deducts the client credit record of a first amount equal to the first price if the one or more users prints a draft version of the spooled document, a second amount equal to the second price if the one or more users views the spooled document and a third amount equal to the third price if the one or more users prints the spooled document. Thus the client station designating a particular print job to a group of the one or more users of the network will be charged in accordance with the document type and in accordance with how many of the designated user prints the print job. For example a bookstore may have access to a printing control system through a printer communication unit and each time the bookstore wishes to sell a copy of a document designated to that book store the book store may perform a print job. Subsequently the bookstore will be charged either daily, weekly, monthly or yearly for the number of copies the bookstore has performed of the print job. The bookstore or generally users are provided with a wide range of options of operations allowing the

users to select at wide variety of operations, which accordingly will be debited the users upon termination of operations. The printer communication unit may obviously be constituted by a personal computer, a work station, a mobile communicator or a mobile phone.

The above object, advantage and feature together with numerous other objects, advantages and features which will become evident from the below detailed description of a preferred embodiment of the present invention is according to a second aspect of the present invention obtained by a printing control method for ensuring one or more users of a network (such as a LAN: local area network, or a WAN: wide area network) secure access to a print job designated to said one or more users of said network, and said printing control system comprising:

(a) designating said print job defining a document containing user readable information and defining a header containing document access information to said one or more users by means of a client station of a first plurality of client stations,

(b) spooling of said document and substituting said document in said print job with a spooled document by means of a spool connected to said first plurality of client stations,

(c) receiving said spooled document and said header from said client station at a job database connected to said spool, defining a document table and a user table in said job database and storing said spooled document in said document table and storing said header in said user table,

(d) receiving user identifying data input by said one or more users to a printer communication unit of a second plurality of printer communication units,

(e) establishing said one or more users in said user table enabling said one or more users access to said network, validating said one or more users on the basis of said user identifying data input to said printer communication unit against user information stored in said user table, and ensuring said user identifying data and said user information provide said one or more users access to said spooled document by means of a server managed by a network administrator and interconnecting said printer communication unit to said job database,

(f) receiving said spooled document from said job database and having a request input for receiving a print request from said one or more users at a printer

connected to said printer communication unit and communicating said print request to said server, and

(g) compiling of said spooled document to be communicated to said printer through said printer communication unit by means of a print engine interconnecting said job database and said printer communication unit, receiving said spooled document at said print engine from said document table in said job database.

The printing control method according to the second aspect of the present invention incorporates above described features, described with reference to the printing control according to the first aspect of the present invention.

Brief description of the drawings

Figure 1 shows a schematic overview of a prior art communication network enabling remote printing.

Figure 2 shows a schematic overview of a printing control system enabling exclusive printing from any printer connected to a network.

Figure 3 shows a principal flow diagram of a method for providing exclusive printing from any printer connected to a network.

Detailed description of the present invention

In the following the printing system according to the preferred embodiment of the present invention will be described in detail with reference to the figures listed above.

Figure 1 shows a schematic example of a prior art communication network designated by numeral 10 in its entirety. The communication network 10 provides communication between individual clients or personal units designated in their entirety by numerals 22, 24 and 26. Each of the individual clients or personal units 22, 24 and 26 comprise a local memory for storing of data files. The communication between the clients 22, 24 and 26 is executed and controlled by a server 12 connected to each of the clients 22, 24 and 26 through connections 16, 18 and 20. Additionally, the server 12 may further be

connected to a printer 14 through connection 28.

The server 12 may be configured so as to allow all clients access to the printer 14. Alternatively, the server 12 may be configured so as to allow a specific client of all clients 22, 24 and 26 connected in the communication network 10 access to the printer 14 and additionally simultaneously deny all other clients access to the printer 14. Likewise any particular client, for example the client 22, may be configured to allow any specific or both the clients 24 and 26 access to a specific part of the client's 22 local memory so that both clients 24 and 26 or a specific client is allowed access to data files stored on that the client 22.

Figure 2 shows schematic overview of a printing control system in accordance with a preferred embodiment of the present invention, which printing control system is designated in its entirety by numeral 100. The printing control system 100 enables any client 102' of a plurality of clients 120 connected in a local area network (LAN) or a wide area network (WAN) remote printing of data files.

The client 102' utilises a spool 106 for compiling of a data file in accordance with a particular printing format. The spool 106 receives the data file through a connection 104 between the client 102' and the spool 106. The client 102' or the plurality of clients 120 in the preferred embodiment of the present invention may be constituted by a mobile phone 102" of a plurality of mobile phones or cellular phones to be configured as clients. The mobile phone 102" transmits the data file through a wireless connection designated by numeral 104' to a receiving spool 106'. The spooling operation may be performed by any general printer driver facility provided in any operational system such as Linux, Unix System V, Windows or Windows NT or spool systems on AS/400 or S/300 midrange and mainframe respectively. The client 102' may further perform an encryption of the data file by means of a port monitor running on the client 102' so as to ensure that the data file is secure and safe against any violation or unintentional disclosure of the contents of the data file to intruders.

The spool 106 establishes a print job by communicating the secured and spooled data file through a connection 108 to a job database 110 comprising a document table 112 and a user table 114. The document table 112 lists a plurality of established print jobs

each containing the transferred secured and spooled data file (a print job document) or alternatively containing information regarding position of the secured and spooled data file in the document table 112 or on the local memory of the client 102'. Each record (a print job header) in the user table 114 contains information regarding an encryption key either public or private key, users allowed by the client 102' to perform the print job or alternatively users disallowed by the client 102' to perform the print job, and status of the present print job (print job header). The client 102' may at any time retrieve information from the user table 114 for determining if the data file is printed and in case it has been printed which user has or which users have printed the data file. In the print by reference system the user indicates a memory location of the print job on the local memory of the client 102' in a LAN or a WAN and as soon as the printing control system 100 identifies and verifies a user the secured and spooled data is decrypted and communicated to a printer 116.

The printer 116 enables printing of the print job document listed in the document table 112. The printer 116 is connected through a printer cable or a network connection 118 to a control unit 120. The printer cable 118 may constitute a serial connection or preferably the printer cable 118 constitutes a parallel connection between the control unit 120 and the printer 116. The control unit 120 is further connected through a link 122 to a front-end module 124, which comprises a display 126, a keyboard 128, a card reader 130 and/or a unit 130' for scanning irises or reading fingerprints. The display 126 provides guidance to the users and may be implemented by a general cathode-ray tube screen or in the preferred embodiment of the present invention the display 126 is constituted by a liquid crystal display (LCD). The keyboard 128 in combination with the card reader 130 enables any user of the printing control system 100 to identify themselves to the front-end module 124. The keyboard 128 may be any standard personal computer keyboard, a numerical keypad, a function keypad or any combinations thereof. In an alternative embodiment of the present invention a touch screen film mounted on the display 126 may constitute the keyboard 128.

The link 122 between the front-end module 124 and the control unit 120 may be constituted by a parallel connection or in the preferred embodiment of the present invention the link 122 is constituted by a serial connection. In case the front-end module 124 and the control unit 120 are incorporated into the printer 116 an internal bus may

constitute the link 122.

Every user of the printing control system 100 has a card 132 for identifying the particular user at the front-end module 124. The card 132 may include information stored there upon by applying magnetically storage, electrically storage or any combinations thereof. In an alternative embodiment of the present invention the card 132 may include information stored there upon by applying optically storage or magneto-optically storage. The information stored on the card 132 may be name of user, password for user, user certificate, total number of print jobs allowed, executed number of print jobs, total number of allowed pages to be printed and total number of printed pages. Further the card 132 may contain information regarding specific access to particular issuers or clients writing to the LAN or WAN. Alternatively, the card 132 may be constituted by a credit card holding information regarding identity of cardholder and financial credit. Means for identifying the user of the printing control system 100 may further be implemented through non-card authentication such as finger print or iris identification.

By presenting the card 132 to the card reader 130 the front-end module 124 may determine the identity of the cardholder and request a pin code from the card holder in order to ensure a match between the cardholder and the certified user of that particular card 132.

The control unit 120 is connected through a connector 134 to a server 136 carrying out requests issued by the control unit 120. The server 136 being connected through a connector 138 further provides an interface between the job database 110 and the control unit 120. The interface ensures that the control unit 120 may communicate with any selected database. The server 136 may be connected to a plurality of control units similar to the control unit 120 either through a LAN or WAN thus enabling printing of a data file to be performed at any control unit connected through the LAN or WAN. Thus a secure and safe transmission of data files between two or more locations is achieved as soon as a user allowed to access the print job has been verified.

When the client 102' communicates a print job to the job database 110 by transmitting a secured and spooled document to the document table 112 of the job database 110, then the client 102' additionally communicates a header associated to the secured and

spooled document, which header contains information regarding which users have access to perform a print of the secured and spooled document and is transferred to the user table 114.

A user may log on to the printing control system 100 according to the preferred embodiment of the present invention at any front-end module by introducing the user's card 132 into the card reader 130 and entering the user's pin code. The front-end module 124 subsequently verifies the user's identity by checking the pin code. If the pin code is not in accordance with the pin code registered in the server 136 for that particular user, then the display 126 informs the user that access is denied. On the other hand if the pin code is in accordance with the pin code registered in the server 136 for that particular user, then the front-end module 124 requests print jobs from the control unit 120. However, only print jobs, which the particular verified user is allowed to perform. The control unit 120 in turn requests this information from the server 136 checking the user table 114 in the job database 110. The verified user may then view a document list, select to printing of any of the print jobs or viewing any of the print jobs on the display 126, which print jobs are designated to the verified user. In case the verified user selects printing of a print job then the job database 110 communicates the print job through a connection 140 to a print engine 142. The print engine 142 enables the control unit 120 to upload the print job containing an secured and spooled data file through a connection 144 and subsequently enables the control unit 120 to further communicate the secured and spooled data file to the printer 116 so as to complete the print job.

A print log record is kept for each print job in the job database 110. The print log record lists users who have printed or viewed the print job, lists which front-end module 124 and which printer 116 was utilised for each particular user viewing or printing the print job, and lists the time and date for each particular user viewing or printing the print job. A port monitor incorporated in the spool 106 parses the print job document in order to count the number of pages to be printed by the printer. A small postscript application is transmitted to the printer 116 before and after performing printing of the print job thus inquiring the printer 116 before performing the print job and subsequent to performing the print job of the hardware page count. The resultant page count of the print job is then introduced into the print log record. In conjunction with performing a hardware

count of printed pages specific user defined billing categories may be introduced in the print log record so as to determine a price for performing the print job. The price may vary as a function of number of pages printed in the print job or in fact the number of copies of the print job performed by the user and may further include a special price for viewing a print job. The print log record may be exported to the client 102' in any required file format such as comma separated format, space separated format, in text format or simply in binary format.

In the preferred embodiment of the present invention the user is, as described above, charged according to the number of pages the user prints, therefor the card issued to the user contains a maximum allowable number of printed pages. The number of printed pages for each card 132 is continuously monitored by the server 136 and the server 136 handles payments for the users printing or viewing of the print job. The price for performing a view or a print of a document may differ between users of the network in accordance to various agreements between the author of a document and the reader of that document e.g. in accordance with copyright agreements. Each specific user may at the front-end module 124 view his status account or credit and view printing costs for printing of the print job. If the specific user has no credit the server 136 will prevent the specific user from accessing the printing control system 100.

In addition to having general printers connected to the printing control system 100, the printing control system 100 further enables connecting copying machines to the LAN or WAN. The printing control system 100 tracks and logs copy clicks from copying machines when a user is identified at a copying machine. The documents in the job database 112 may be accessed at the copying machines by importing the documents to the copy machine in a variable file format.

The server 136 may be connected through a WAN to a plurality of servers and thus enable communication of print jobs and print log record information between the plurality of servers and the server 136. Thus the printing facilities provided by the server 136 is extended to the plurality of servers thereby introducing a safe wide printing control system for distribution of print jobs and cost of performing print jobs.

The client 102' may according to preferred embodiment of the present invention be

constituted by personal computers, computer workstations or in an alternative embodiment of the present invention constituted by a combination of personal computers, computer workstations and mobile communication clients such as a mobile phone or a mobile communicator. The connections provided in the printing control system 100 is constituted by connections such as current carrying cables and/or optical cables or in an alternative embodiment of the present invention by mobile radio transmission links or by any combination of current carrying cables, optical cables and mobile radio transmission links.

Figure 3 shows a principle flow diagram designated in its entirety by numeral 200 and describing the operations of the printing control system according to the preferred embodiment of the present invention. The flow diagram 200 is shown as a sequentially evolving system for explanatory reasons only, the preferred embodiment of the present invention, however, provides a system performing parallel operations. Some operations are concurrently performed by the client 102', the server 136 and by a printer communication unit constituting the control unit 120, the front end 124 and the card reader 130. The term parallel operation is in this context to be construed as performing concurrent operations, a multiple of operations simultaneously or as performing real time operations.

In block 202, shown in the flow diagram 200 a plurality of clients create a number of print job records at any time. The print job record consists of a data file or document or alternatively a pointer pointing to an address of the data file or document to be transferred to any designated user of the printing control system. The print job record further consists of a user file or header associated with the data file or document to be transferred through the printing control system, which user file or header includes information regarding users defined as designated users allowed access to the document, time during which the designated users are allowed access to the document and/or an address pointer to the document.

When the printing control system according to the preferred embodiment of the present invention transfers data from one unit or element to the next in the printing control system the data is transferred utilising secure networking procedures providing either symmetrical encryption and/or asymmetrical encryption. Thus the printing control

system provides a safe communication between the plurality of clients and the designated users of the printing control system.

In block 204, the data file or document is spooled providing a document in a printer readable format. The spooling operation is performed at each client or in an alternative embodiment of the present invention at the server. Since in the preferred embodiment of the present invention the client performs the spooling operations a plurality of spooling operations may be performed simultaneously at each client.

As the data file or document is spooled the print job is transferred to the job database in block 206. The document is written to a document table and the user file or header is written to a user table, which document table and user table is described with reference to figure 2. In the printing control system according to an alternative embodiment of the present invention the user file or a header contains a pointer addressing the document in a storage medium at the client. The client provides the document to designated users of the printing control system upon request from a designated user. In this alternative embodiment the print job is written to the user table since the user file or header contains all necessary information for the printing control system to extract the document from the client.

In block 208, the server is notified of the existence of a print job transferred from any of the plurality of clients in the printing control system. Subsequently the server enters a waiting mode with respect to the particular print job shown as question block 210. The server waits for any user to request the particular print job at any printer connected in the printing control system. If a user performs a request for any print job at any of the printer communication unit connected in the printing control system, then the server initiates a verification of the requesting user shown as block 212 by correlating user log on information with user information stored in a server memory.

In block 214, the server determines whether the user should have access to the printing control system and provided the user log on information does not correspond with the user information stored in the server memory the user request is denied. Alternatively, the server transfers user options for the requesting user shown in block 216 to the printer communication unit. The user options provided to the requesting user vary for

each requesting user in accordance with assigned options for each requesting user in the user table. The user options may be: List accessible print jobs, Select print job, View print job, Print print job, Show user account, Show number of pages of selected print job, Delete selected print job, Mark print job as not-deleteable, Display information about print job such information as duplex, simplex, colour, name, size, date, data-stream (PostScript, PDF, PCL, PCLXL, IPDS or AFP format), expiration data and End.

In block 218, the server waits for the requesting user to select one of the options provided to him. During this waiting session shown as block 218 the server performs alternative operations while continuously monitoring the printer communication unit for a selection. When the requesting user has selected which operations to perform the server initiates the user-defined operations at the first available possibility, shown in block 220. The operations may be performed by the printer communication unit or by any printer connected to the printer communication unit.

The selection made by the requesting user and the time for the request is written to a print log file during block 222. This operation may be performed subsequent to the requested tasks or concurrently to the requested tasks. Additionally, the server updates a user account in accordance with the selected operations and with a predefined price for the requesting user for the particular selected operations during block 224.

The server monitors the operations performed on each print job and sets a flag or provides a signal when the print job according to the user file or header associated with each print job is or rather should be concluded. In case the time in which the print job should remain accessible to the designated users of the printing control system according to the preferred embodiment of the present invention has expired the server sets the flag. In block 226, the printing control system performs a check for whether the flag is set by the server.

If the flag is set then the operations performed on the associated print job are terminated. If on the other hand the flag is not set then the printing control system continues to examine whether all designated users have accessed the print job, shown in block 228. In case not all designated users have accessed the print job the printing control system returns back to the questioning block 210. Alternatively the printing

control system deletes the print job from the job database in block 230, notifies the server of the deletion of the print job in block.232 and terminates further operations on the print job in block 234.

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Claims

1. A printing control system for ensuring one or more users of a network (such as a LAN: local area network, or a WAN: wide area network) secure access to a print job designated to said one or more users of said network, and said printing control system comprising:

(a) a client station of a first plurality of client stations for designating said print job to said one or more users, said print job defining a document containing user readable information and defining a header containing document access information,

(b) a spool connected to said client station for spooling of said document and substituting said document in said print job with a spooled document,

(c) a job database connected to said spool for receiving said spooled document and said header from said client station, said job database defining a document table and a user table and storing said spooled document in said document table and storing said header in said user table,

(d) a printer communication unit of a second plurality of printer communication units for receiving user identifying data input by said one or more users to said printer communication unit,

(e) a server managed by a network administrator and interconnecting said printer communication unit to said job database for establishing said one or more users in said user table enabling said one or more users access to said network, for validating said one or more users on the basis of said user identifying data input to said printer communication unit against user information stored in said user table, and for ensuring said user identifying data and said user information provide said one or more users access to said spooled document,

(f) a printer connected to said printer communication unit for receiving said spooled document from said job database and having a request input for receiving a print request from said one or more users and communicating said print request to said server, and

(g) a print engine interconnecting said job database and said printer communication unit for compiling of said spooled document to be communicated to said printer through said printer communication unit, said print engine receiving said spooled document from said document table in said job database.

2. A printing control system according to claim 1, wherein said network is established by bus connections, by cable connections such as current carrying cables and/or optical cables, by wireless links such as mobile radio transmission links, infra-red transmission links or ultra-sonic transmission links, or by any combination thereof.

3. A printing control system according to claim 1 or 2, wherein said document is constituted by a file configured in any binary format such as text format, comma or space separated variable format or any user or software defined format.

4. A printing control system according to any of the claims 1 to 3, wherein each of said first plurality of client stations comprise a local memory, a display, a keyboard and preferably a local central processing unit such as constituted by personal computers, computer workstations and/or such as constituted by mobile communication clients like mobile phones or mobile communicators or any combinations thereof.

5. A printing control system according to any of the claims 1 to 4, wherein said spool spools said document according to a data stream format such as to PostScript, PDF, IPDS, PCL, PCLXL or AFP format.

6. A printing control system according to any of the claims 1 to 5, wherein said printing control system establishing a secure network by utilising secure networking procedures providing symmetrical and/or asymmetrical encryption in accordance with public and/or private encryption keys.

7. A printing control system according to any of the claims 1 to 6, wherein said spool incorporates a port monitor for parsing said spooled document in order to determine data stream format such as PostScript, PDF, IPDS, PCL, PCLXL or AFP format, and further to determine print formats such as simplex, duplex, colour, page size, page rotation, tray, stapling, and number of pages said spooled document will constitute during printing of said spooled document.

8. A printing control system according to any of the claims 1 to 7, wherein said job database is established on a memory storage unit accessible by said server such as magnetic storable hard disk, magnetic storable tape and/or magneto-optic storage disks on said server and having said user table and said document table allocated in storage spaces on said memory storage unit.

9. A printing control system according to claim 8, wherein said user table allocates a record space in said memory storage unit for said header, and said document table allocates a storage space in said memory storage unit for said spooled document.

10. A printing control system according to claim 8, wherein said user table allocates a

record space in said memory storage unit for said header, and said document table allocates a storage spaced in said memory storage unit for a pointer to said spooled document on said local memory of said client station or in said document table.

11. A printing control system according to any of the claims 1 to 10, wherein said header contains information such as information regarding data stream format such as PostScript, PDF, IPDS, PCL, PCLXL or AFP format, print formats such as simplex, duplex, colour, page size, page rotation, tray, stapling, number of pages of said spooled document, access for said one or more users to said spooled document, a digital client signature, duration in which said one or more users is allowed access to said spooled document, and number of pages defined by said spooled document or any combination thereof.

12. A printing control system according to any of the claims 1 to 11, wherein said server incorporates said spool, said job database and said print engine in a server memory.

13. A printing control system according to any of the claims 1 to 12, wherein said printer communication unit comprises a front-end module for identifying said one or more users of said network and a control unit for providing an interface for said print engine and said server to said printer.

14. A printing control system according to claim 13, wherein said front-end module comprises a display for showing said one or more users accessible print jobs and operations menus, and comprises a keypad for providing an interface between said one or more users and said front-end.

15. A printing control system according to claim 14, wherein said display utilising cathode-ray tube screen techniques or said display utilising liquid crystal display techniques.

16. A printing control system according to claims 14 or 15, wherein said keypad is constituted by a general personal computer keyboard, a numerical keypad or a functional keypad.

17. A printing control system according to claims 14 or 15, wherein said keypad is constituted by a touch sensitive film mounted on said display so as to allow said one or more users to perform user operations by pressing said touch sensitive film in accordance with information showed on said display.

18. A printing control system according to any of the claims 13 to 17, wherein said control unit communicates with said front-end module and said printer through a parallel connection, a serial connection, a local area network (LAN) connection, a

wireless connection such as a mobile radio transmission connection, an infra-red transmission connection or an ultra-sonic transmission connection, or any combination thereof.

19. A printing control system according to any of the claims 13 to 18, wherein said front-end module comprises a iris scanner and/or a fingerprint reader for identifying said one or more users at said front-end module and/or preferably a card reader for reading card information from a card such as a credit card, a library card, a health insurance card, a driving licence card, a passport card, a membership card, a company identity card or an institutional identity card, said card information including information such as card user name, card user ID, card user credit, card user's access rights, card user's server address, card user identifying number, card issuing date, card identity number, digital signature of one or more of said client station of said first plurality of client stations or any combination thereof.

20. A printing control system according to claim 19, wherein said card utilises electronic storage techniques, electro-magnetic storage techniques, magnetic storage techniques, magneto-optic storage techniques, optic storage techniques or any combinations thereof for storing of said card information.

21. A printing control system according to claims 19 or 20, wherein said user identifying data includes said card information and a first user pin code and wherein said user information stored in said user table includes system user name, system user ID, system user credit, system user's access rights, system user's server address, system user identifying number, system user PUK code, system user initiation date or any combination thereof, and a second user pin code.

22. A printing control system according to any of the claims 19 to 21, wherein said card reader receives said card information from said card and communicates said card information to said server and said front-end module requests a first user pin code from said one or more users.

23. A printing control system according to any of the claims 19 to 22, wherein said server establishes and validates said one or more users by identifying said user information in said user table on the basis of said user identifying data and by matching said first pin code with said second pin code or alternatively during first use of said card by matching said system user PUK code with an entered user PUK code and said server locating in said document table all print jobs designated for said one or more users and communicating titles of all print jobs designated for said

one or more users to said front-end display enabling said one or more users to select a print job or a multiplicity of print jobs.

24. A printing control system according to any of the claims 13 to 23, wherein said server receives a print job selection from said one or more users at said front-end module and said server providing said one or more users access to said spooled document in said document table in said job database upon validation of said user identifying data.

25. A printing control system according to any of the claims 14 to 24, wherein said server provides an opportunity for said one or more users to delete said spooled document from said one or more users' print job list, determine desired number of copies required of said spooled document, retaining printing of said spooled document in a draft version for a first price, view said spooled document on said display for a second price, print said spooled document on said printer for a third price and terminate further operations on said front-end module.

26. A printing control system according to claim 25, wherein said server deducts said credit of said one or more users of a first amount equal to said first price if said one or more users prints a draft version of said spooled document, a second amount equal to said second price if said one or more users views said spooled document and a third amount equal to said third price if said one or more users prints said spooled document, or said server establishing a client credit record for each of said client stations designating said one or more users deducts said client credit record of a first amount equal to said first price if said one or more users prints a draft version of said spooled document, a second amount equal to said second price if said one or more users views said spooled document and a third amount equal to said third price if said one or more users prints said spooled document.

27. A printing control system according to any of the claims 1 to 26, wherein said printer communication unit is constituted by a personal computer, a work station, a mobile communicator or a mobile phone.

28. A printing control method for ensuring one or more users of a network (such as a LAN: local area network, or a WAN: wide area network) secure access to a print job designated to said one or more users of said network, and said printing control system comprising:

(h) designating said print job defining a document containing user readable information and defining a header containing document access information to

said one or more users by means of a client station of a first plurality of client stations,

(i) spooling of said document and substituting said document in said print job with a spooled document by means of a spool connected to said first plurality of client stations,

(j) receiving said spooled document and said header from said client station at a job database connected to said spool, defining a document table and a user table in said job database and storing said spooled document in said document table and storing said header in said user table,

(k) receiving user identifying data input by said one or more users to a printer communication unit of a second plurality of printer communication units,

(l) establishing said one or more users in said user table enabling said one or more users access to said network, validating said one or more users on the basis of said user identifying data input to said printer communication unit against user information stored in said user table, and ensuring said user identifying data and said user information provide said one or more users access to said spooled document by means of a server managed by a network administrator and interconnecting said printer communication unit to said job database,

(m)receiving said spooled document from said job database and having a request input for receiving a print request from said one or more users at a printer connected to said printer communication unit and communicating said print request to said server, and

(n) compiling of said spooled document to be communicated to said printer through said printer communication unit by means of a print engine interconnecting said job database and said printer communication unit, receiving said spooled document at said print engine from said document table in said job database.

29. A printing control method according to claim 28, wherein said method incorporating features as described with reference to said printing control system according to claims 2 to 27.

30. A printing control system generally as herein described, with reference to and for as illustrated in Figures 2 and 3 of the accompanying drawings.

31. A printing control method generally as herein described, with reference to and for as illustrated in Figures 2 and 3 of the accompanying drawings.

AMENDMENTS TO THE CLAIMS HAVE BEEN FILED AS FOLLOWS:

1. A printing control system for ensuring one or more users of a network secure access to a print job designated to said one or more users of said network, and said printing control system comprising:

(a) a client station of a first plurality of client stations for designating said print job to said one or more users, said print job defining a document containing user readable information and defining a header containing document access information,

(b) a spool connected to said client station for spooling of said document and substituting said document in said print job with a spooled document,

(c) a job database connected to said spool for receiving said spooled document and said header from said client station, said job database defining a document table and a user table and storing said spooled document in said document table and storing said header in said user table,

(d) a printer communication unit of a second plurality of printer communication units for receiving user identifying data input by said one or more users to said printer communication unit,

(e) a server managed by a network administrator and interconnecting said printer communication unit to said job database for establishing said one or more users in said user table enabling said one or more users access to said network, for validating said one or more users on the basis of said user identifying data input to said printer communication unit against user information stored in said user table, and for ensuring said user identifying data and said user information provide said one or more users access to said spooled document,

(f) a printer connected to said printer communication unit for receiving said spooled document from said job database and having a request input for receiving a print request from said one or more users and

communicating said print request to said server, and

(g) a print engine interconnecting said job database and said printer communication unit for compiling of said spooled document to be communicated to said printer through said printer communication unit, said print engine receiving said spooled document from said document table in said job database.

2. A printing control system according to claim 1, wherein said network is established by bus connections, by cable connections, by wireless links or by any combination thereof.

3. A printing control system according to claim 1 or 2, wherein said document is constituted by a file configured in any binary format.

4. A printing control system according to any of the claims 1 to 3, wherein each of said first plurality of client stations comprise a local memory, a display and a keyboard.

5. A printing control system according to any of the claims 1 to 4, wherein said spool spools said document according to a data stream format.

6. A printing control system according to any of the claims 1 to 5, wherein said printing control system establishes a secure network by utilising secure networking procedures providing symmetrical and/or asymmetrical encryption in accordance with public and/or private encryption keys.

7. A printing control system according to any of the claims 1 to 6, wherein said spool incorporates a port monitor for parsing said spooled document in order to determine data stream format and further to determine

print formats.

8. A printing control system according to any of the claims 1 to 7, wherein said job database is established on a memory storage unit accessible by said server and having said user table and said document table allocated in storage spaces on said memory storage unit.

9. A printing control system according to claim 8, wherein said user table allocates a record space in said memory storage unit for said header, and said document table allocates a storage space in said memory storage unit for said spooled document.

10. A printing control system according to claim 8, wherein said user table allocates a record space in said memory storage unit for said header, and said document table allocates a storage space in said memory storage unit for a pointer to said spooled document on said local memory of said client station or in said document table.

11. A printing control system according to any of the claims 1 to 10, wherein said header contains information regarding data stream format, print formats, access for said one or more users to said spooled document, a digital client signature, duration in which said one or more users is allowed access to said spooled document, and number of pages defined by said spooled document or any combination thereof.

12. A printing control system according to any of the claims 1 to 11, wherein said server incorporates said spool, said job database and said print engine in a server memory.

13. A printing control system according to any of the claims 1 to 12,

wherein said printer communication unit comprises a front-end module for identifying said one or more users of said network and a control unit for providing an interface for said print engine and said server to said printer.

14. A printing control system according to claim 13, wherein said front-end module comprises a display for showing said one or more users accessible print jobs and operations menus, and comprises a keypad for providing an interface between said one or more users and said front-end.

15. A printing control system according to claim 14, wherein said display utilises cathode-ray tube screen techniques or said display utilising liquid crystal display techniques.

16. A printing control system according to claims 14 or 15, wherein said keypad is constituted by a general personal computer keyboard, a numerical keypad or a functional keypad.

17. A printing control system according to claims 14 or 15, wherein said keypad is constituted by a touch sensitive film mounted on said display so as to allow said one or more users to perform user operations by pressing said touch sensitive film in accordance with information shown on said display.

18. A printing control system according to any of the claims 13 to 17, wherein said control unit communicates with said front-end module and said printer through a parallel connection, a serial connection, a local area network (LAN) connection, a wireless connection or any combination thereof.

19. A printing control system according to any of the claims 13 to 18,

wherein said front-end module comprises a iris scanner and/or a fingerprint reader for identifying said one or more users at said front-end module and/or a card reader for reading card information from a card.

20. A printing control system according to claim 19, wherein said card utilises electronic storage techniques, electromagnetic storage techniques, magnetic storage techniques, magneto-optic storage techniques, optic storage techniques or any combinations thereof for storing of said card information.

21. A printing control system according to claim 19 or claim 20, wherein said user identifying data includes said card information and a first user pin code and wherein said user information stored in said user table includes system user name, system user ID, system user credit, system user's access rights, system user's server address, system user identifying number, system user PUK code, system user initiation date or any combination thereof, and a second user pin code.

22. A printing control system according to any of claims 19 to 21, when including a card reader wherein said card reader receives said card information from said card and communicates said card information to said server and said front-end module requests a first user pin code from said one or more users.

23. A printing control system according to any of claims 19 to 22, wherein said server establishes and validates said one or more users by identifying said user information in said user table on the basis of said user identifying data and by matching said first pin code with said second pin code or alternatively during first use of said card by matching said system user PUK code with an entered user PUK code and said server locating in

said document table all print jobs designated for said one or more users and communicating titles of all print jobs designated for said one or more users to said front-end display enabling said one or more users to select a print job or a multiplicity of print jobs.

24. A printing control system according to any of claims 13 to 23, wherein said server receives a print job selection from said one or more users at said front-end module, said server providing said one or more users access to said spooled document in said document table in said job database upon validation of said user identifying data.

25. A printing control system according to any of claims 14 to 24, wherein said server provides an opportunity for said one or more users to delete said spooled document from said one or more users' print job list, determine a desired number of copies required of said spooled document, retain printing of said spooled document in a draft version for a first price, view said spooled document on said display for a second price, print said spooled document on said printer for a third price and terminate further operations on said front-end module.

26. A printing control system according to claim 25, wherein said server deducts a system credit of said one or more users of a first amount equal to said first price if said one or more users prints a draft version of said spooled document, a second amount equal to said second price if said one or more users views said spooled document and a third amount equal to said third price if said one or more users prints said spooled document, or said server establishing a client credit record for each of said client stations designating said one or more users deducts said client credit record of a first amount equal to said first price if said one or more users prints a draft version of said spooled document, a second amount equal to said second

price if said one or more users views said spooled document and a third amount equal to said third price if said one or more users prints said spooled document.

27. A printing control system according to any of claims 1 to 26, wherein said printer communication unit is constituted by a personal computer, a work station, a mobile communicator or a mobile 'phone.

28. A printing control method for ensuring one or more users of a network secure access to a print job designated to said one or more users of said network, and said printing control method comprising:

(a) designating said print job defining a document containing user readable information and defining a header containing document access information to said one or more users by means of a client station of a first plurality of client stations,

(b) spooling of said document and substituting said document in said print job with a spooled document by means of a spool connected to said first plurality of client stations,

(c) receiving said spooled document and said header from said client station at a job database connected to said spool, defining a document table and a user table in said job database and storing said spooled document in said document table and storing said header in said user table,

(d) receiving user identifying data input by said one or more users to a printer communication unit of a second plurality of printer communication units,

(e) establishing said one or more users in said user table enabling said one or more users access to said network, validating said one or more users on the basis of said user identifying data input to said printer communication unit against user information stored in said user table, and ensuring said user identifying data and said user information provide said

one or more users access to said spooled document by means of a server managed by a network administrator and interconnecting said printer communication unit to said job database,

(f) receiving said spooled document from said job database and having a request input for receiving a print request from said one or more users at a printer connected to said printer communication unit and communicating said print request to said server, and

(g) compiling said spooled document to be communicated to said printer through said printer communication unit by means of a print engine interconnecting said job database and said printer communication unit, receiving said spooled document at said print engine from said document table in said job database.

29. A printing control method according to claim 28, wherein said method incorporates features as described with reference to said printing control system according to claims 2 to 27.

30. A printing control system according to claim 4, wherein each of said first plurality of client stations includes a local central processing unit.

31. A printing control system generally as herein described, with reference to and/or as illustrated in Figures 2 and 3 of the accompanying drawings.

32. A printing control method generally as herein described, with reference to and/or as illustrated in Figures 2 and 3 of the accompanying drawings.

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Databases searched:

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UK Cl (Ed.R): G4H (HTG)

Int Cl (Ed.7):

Other: Online: WPI, EPODOC, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	EP 0818724 A1 (XEROX) eg abstract	-
A	EP 0665486 A2 (AT&T) eg abstract	-

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